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(11) Disclosure for Public Inspection of Patent Application
(12) Official Gazette of Patent Disclosures *(A)*
Sho[wa]. *63* [1988] - *24501*

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Request for Examination: Not Requested Number of Inventions: *1* (Total *3* Pages)

(54) Name of Invention: Oil Impregnated Electrical

(21) Pat[ent]. App[lication]. Sho[wa]. *61* [1986] - *168570*
(22) Application Sho[wa]. *61*st [Year of] *(1986) 7*th Month *16*th Day [July 16, 1986]

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Specifications

1. Name of Invention

Oil Impregnated Electrical Machinery

2. Scope of the Patent Claims

(1) Oil impregnated electrical machinery characterized by the use of electrical insulation oil to which is added an oil mixture consisting of a combination of rapeseed oil, which is a vegetable oil, with alkyl benzene, diarylethane, alkyl naphthalene or other aromatic hydrocarbon compounds, and to which an alkyl methacrylate type of polymer has been added.

(2) Oil impregnated electrical machinery of Item *1* of the scope of the patent claims to which *0.1 ~ 4 wt. %* of alkyl methacrylate type of polymer has been added.

3. Explanation of the Details of the Invention

Field of Industrial Use

This invention is an attempt to improve the low temperature characteristics related to oil impregnated electrical machinery such as condensers, transformers, et cetera, and to offer oil impregnated electrical machinery of high reliability.

The Hithertofore Technology and the Problems Thereof

[translation of page "1" continued on 2/7]

[translation of page "77" continued from 1/7]

Hithertofore, for stable use of electrical machinery which utilizes a vegetable oil as insulation oil of low temperature characteristics, in particular down to *-20 °C*, measures with which to achieve improvement low temperature characteristics by combining aromatic hydrocarbon type of compounds such alkyl benzene, diarylethane, alkyl naphthalene, et cetera have been designed (Pat[ent]. App[lication]. Sho[wa]. *58* [1983] - *144240*, *58* [1983] - *144241*), but it has been determined that this is insufficient for long-term stable use under lower temperatures.

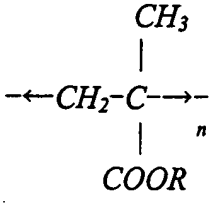
Procedures for Resolving the Problematic Points

In order to improve upon the low temperature characteristics of oil impregnated electrical machinery with which an oil mixture of rapeseed oil, which is a vegetable oil, and an aromatic hydrocarbon type of compound such as alkyl benzene, diarylethane, alkyl naphthalene, et cetera, it was necessary to improve upon the low temperature characteristics of the oil mixture.

It was then this invention confirmed through experiments the utility of the addition of alkyl methacrylate type of polymers to said oil mixture.

That is to say, alkyl methacrylate type of polymers is generally expressed as [continued on page "-2-"]

[Please refer to the original for actual illustration.]



R is the alkyl group

n is the degree of polymerization

Pat[ent]. Dis [closure]. Sho[wa]. *63* [1988] - *24501(2)*

Poly alkyl methacrylate (hereinafter referred to as *PMA*) is one type of substance commonly added to petroleum type lubricants in order to lower the pour point; this invention discovered that it is also effective relative to the above discovered oil mixture which are used as electrical insulation oils, and it was confirmed that *0.1 ~ 4wt%* is the appropriate *PMA* ratio.

Embodiment

In the following is given, by means of an embodiment, an explanation of the details of this invention.

A condenser element such a dual sided metallic sheet is the electrode and a *PP* film is the inductor is impregnated with the electrical machinery insulation oil obtained in Chart *1* to create a *30μP* electrostatic model condenser, with which the corona starting voltage *-25 °C* is measured. The results thereof, as indicated in Chart *1* are such that when *0.1~4.0wt%* is added, the corona starting voltage rises , with the effect that stable use at low temperatures is possible.

[translation of page "2" continued on 3/7]

[translation of page "2" continued from 2/7]

Furthermore, using 20 each of condensers obtained by impregnating test units with *Nos. 7* and *13* of the hithertofore and *Nos. 9* and *15* of this invention, life expectancy tests at *-25 °C* with electrical voltage of *1.3* times the rate load applied were conducted, and the residual rates of the condensers were obtained. The results of the tests were as indicated on Figure *1*; test materials *Nos. 7* and *13* of the hithertofore were destroyed, but no breakdown had occurred with the *Nos. 9* and *15* of this invention after *1000* hours had passed.

[translation of page "-2-" continued on 4/7]

[translation of page "2" continued from 3/7]

Mixture Ratio / Item	Rapeseed Oil + Alkyl Benzene (20 vol. %)						Rapeseed Oil + Alkyl Benzene (30 vol. %)						Rapeseed Oil + Diarylethane (30 vol. %)					
	Quantity. of *PMA* Added *(wt. %)*						Quantity. of *PMA* Added *(wt. %)*						Quantity. of *PMA* Added *(wt. %)*					
	0	*0.1*	*1.0*	*3.0*	*4.0*	*5.0*	*0*	*0.1*	*1.0*	*3.0*	*4.0*	*5.0*	*0*	*0.1*	*1.0*	*3.0*	*4.0*	*5.0*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
Corona Starting Voltage *(VAC)*	*750*	*1200*	*1220*	*1280*	*1250*	*750*	*900*	*1300*	*1360*	*1400*	*1340*	*910*	*900*	*1310*	*1460*	*1410*	*1400*	*910*

[Please note that it was not possible to insert the upper diagonal line in the upper left box of this chart. The text included in that triangle (against the consecutive numbers 1 through 18) is as follows;] Pour Point Characteristic

[translation of page "2" continued from 4/7]

Effects of the Invention

As indicated in the above, it was determined that the addition of PMA is effective in improving the low temperature characteristics of oil mixtures using rapeseed oil, which is a vegetable oil; it that with which the reliability of oil impregnated electrical machinery can be improved.

Although condensers have been indicated as one example of electrical machinery, the same sort of effect is also obtained regarding not only for condensers which use other derivatives such as polyester film, and also those which use metallic polypropylene film and metallic polyester film; in addition to such condensers, but also for other oil impregnated electrical machinery. Experiments were conducted regarding *PMA* of an average molecular weight of *100000*; the same sort of results were obtained.

4. Simple Explanation of the Figures

Figure 1 is a diagram of the characteristics of the rate remaining with the passage of time during a durability under low temperature test.

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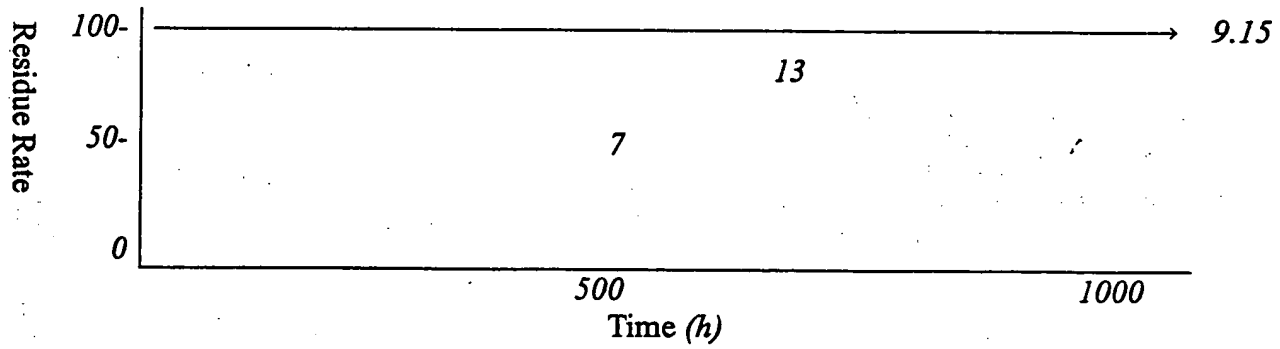
Pat[ent]. Dis [closure]. Sho[wa]. *63* [1988] - *24501(3)*

Figure 1
[Please refer to the original for the details of the figure.]



Procedural Addendum Document (Voluntary)

*61*st Year of Showa *9*th Month *5*th Day [September 5, 1986]
To the Director General of the Patent Office

[translation of page "3" continued on 6/7]

[translation of page "3" continued from 5/7]

([stamped] Agreed)

1. Indication of the Matter
*61*st Year of Showa [1986] Patent Application Number *168570*
2. Name of Invention
Oil Impregnated Electrical Machinery
3. Party Making the Addendum
Relationship to Matter: Patent Applicant
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Uehara Bldg. *3*rd Floor, *4* of Number *191* Nakahori-cho Karasuma-Higashiiru
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(460) Nihon Kondensa Kogyo Kabushiki Kaisha [Nichicon Capacitor Ltd.]
Telephone Number: *(231) 8461*
Kaichiro Hirai
Representative: Kaichiro Hirai ([illegible round seal])
4. Subject of the Addendum
"Column for explanation of the details of the invention of specification column"
([stamped] Patent Office / *61. 9. 8* [September 8, 1986] [cut off])
5. Contents of Addendum
(1) Correct the *2*nd page of the Specifications to read as indicated in the attachment.

oil of low temperature characteristics, in particular down to *-20 °C*, measures with which to achieve improvement low temperature characteristics such as the combining aromatic hydrocarbon type of compounds such alkyl benzene, diarylethane, alkyl naphthalene, et cetera have been designed (Pat[ent]. App[lication]. Sho[wa]. *58* [1983] - *144240*, *58* [1983] - *144241*), but it has been determined that this is insufficient for long-term stable use under lower temperatures.

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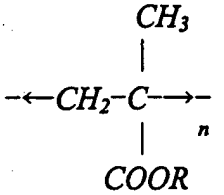
[translation of page "3" continues on 7/7]

[translation of page "3" continued from 6/7]

[Please refer to the original for actual illustration.]



R is the alkyl group

n is the degree of polymerization

[Translator's Note: The phonetic reading of the name appearing here (Shigeyoshi Nishikawa) is an educated guess. It is not possible to give a definitive phonetic reading of most names of individuals unless it is specifically given using the phonetic syllabary (as has been given for the name of Kaichiro Hirai).]